

ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:
Climate Prediction Center / NCEP
29 September 2014

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Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

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ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

Positive equatorial sea surface temperature (SST) anomalies continue across most of the Pacific Ocean.

The chance of El Niño is at 60-65% during the Northern Hemisphere fall and winter.*

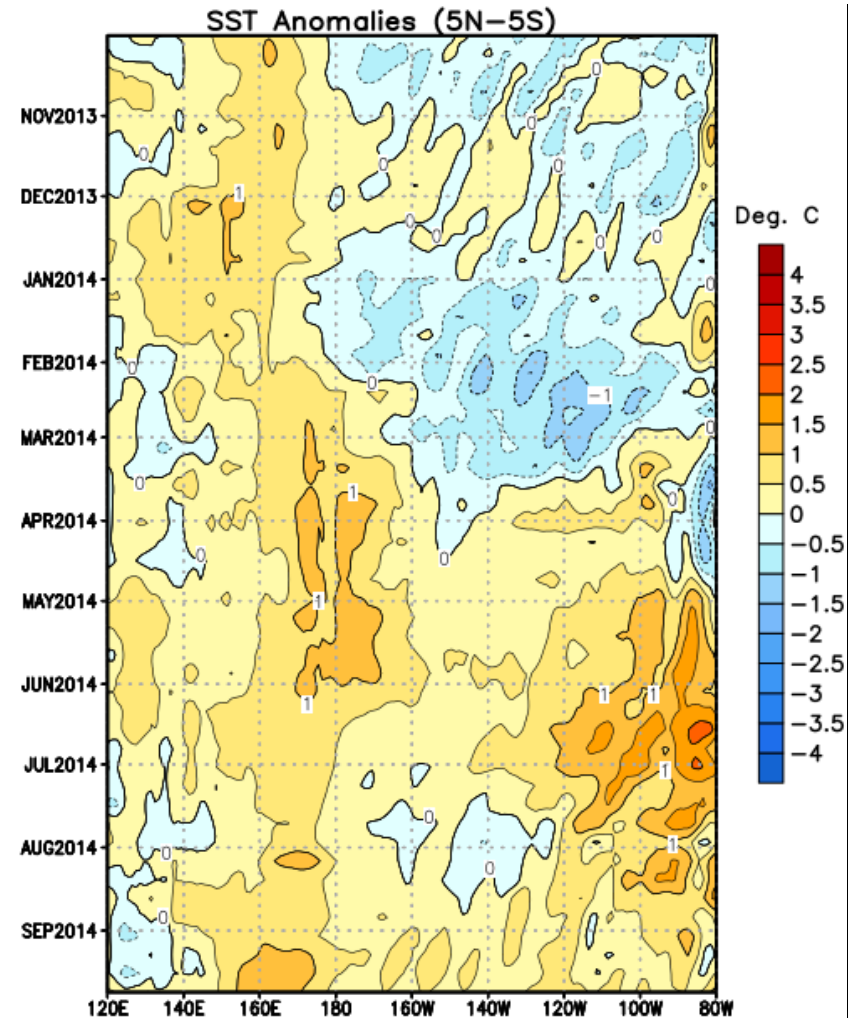
* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).

Recent Evolution of Equatorial Pacific SST Departures (°C)

From January- February 2014, SSTs were mostly below average across the eastern equatorial Pacific.

From March-June 2014, above-average SSTs (departures $>0.5^{\circ}\text{C}$) were evident near the Date Line and in the eastern Pacific.

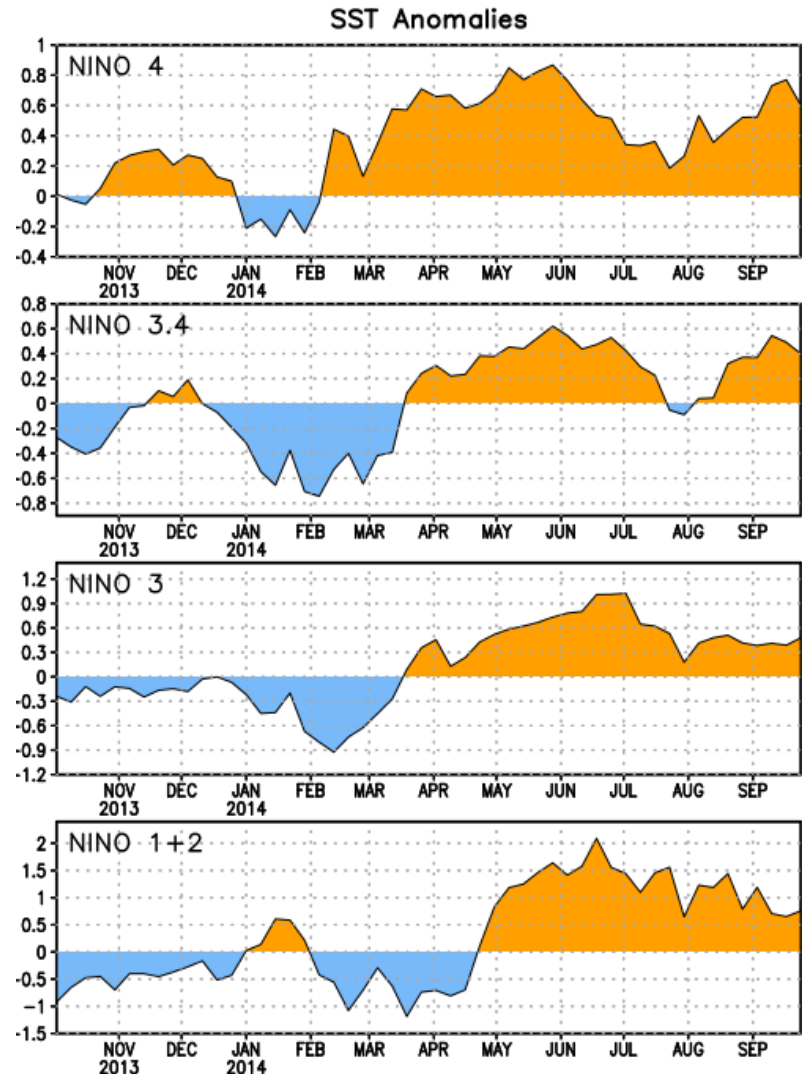
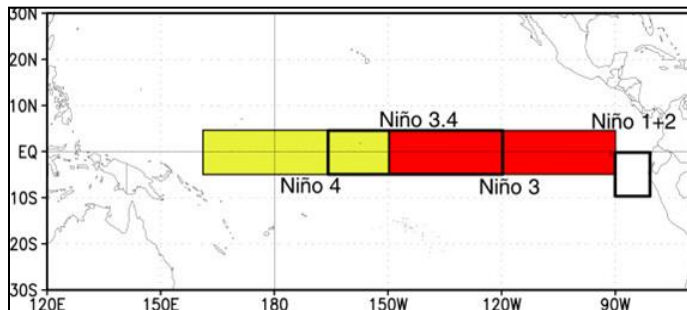
Recently, positive SST anomalies cover much of the equatorial Pacific.



Niño Region SST Departures (°C) Recent Evolution

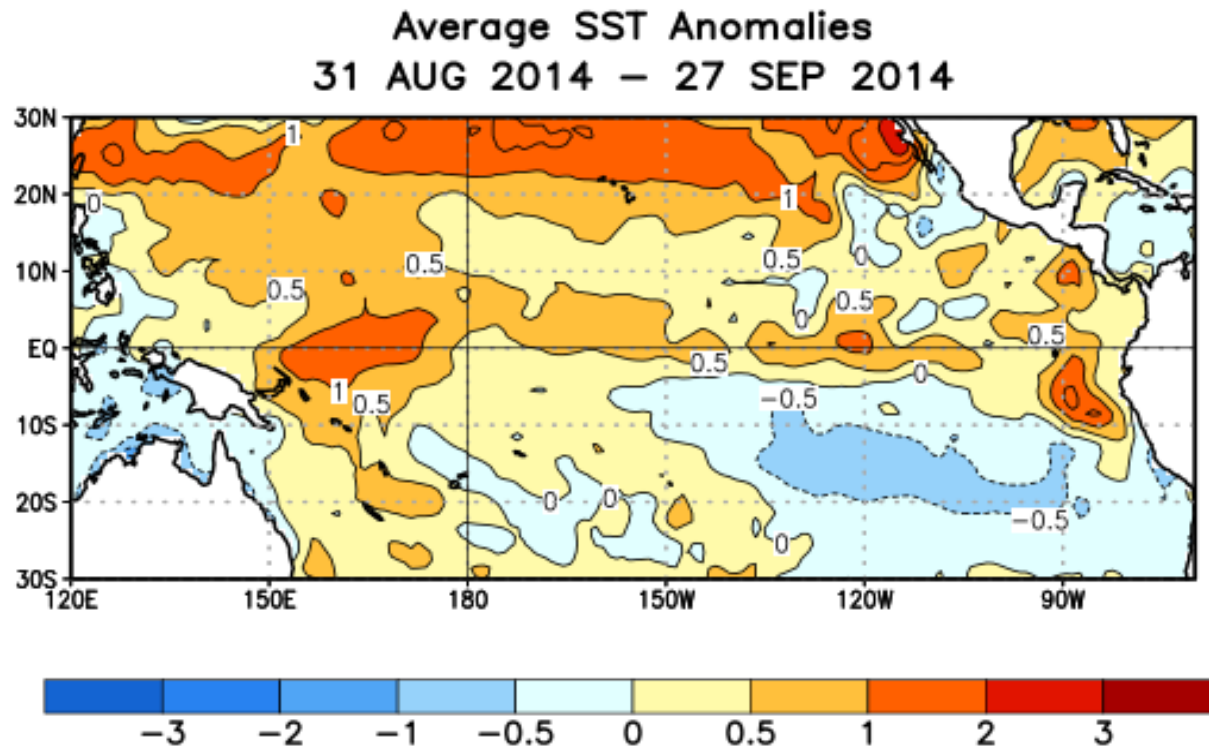
The latest weekly SST departures are:

Niño 4	0.6°C
Niño 3.4	0.4°C
Niño 3	0.5°C
Niño 1+2	0.8°C



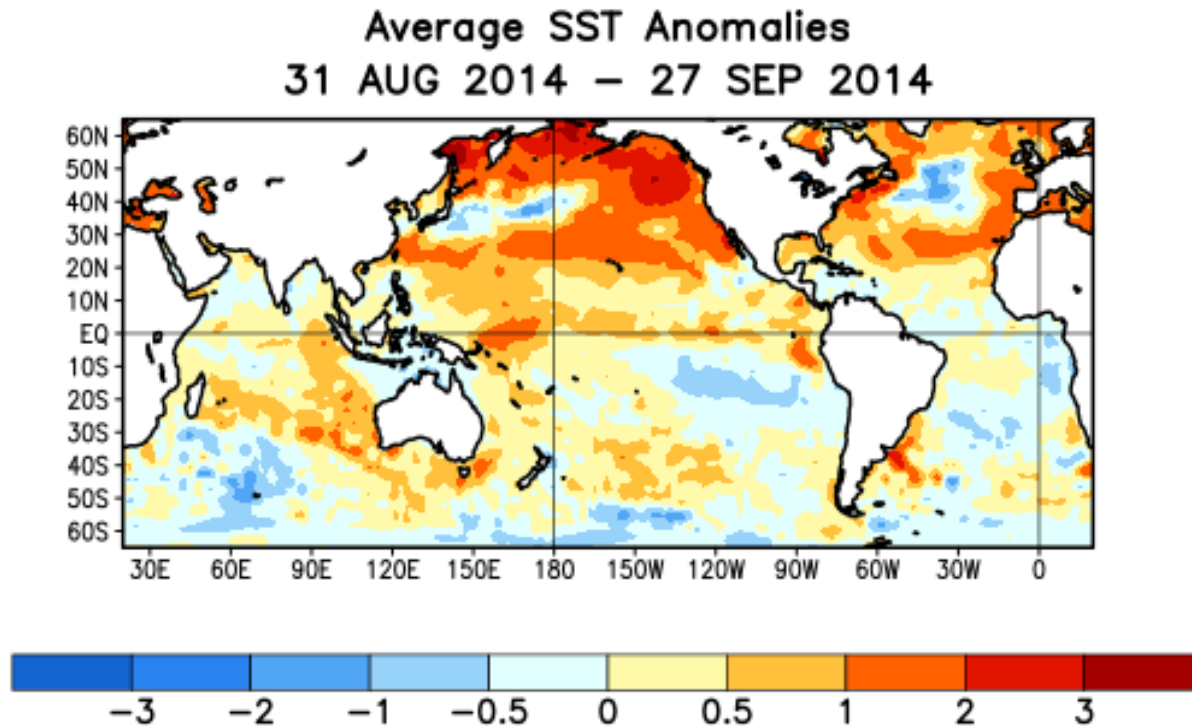
SST Departures ($^{\circ}\text{C}$) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific.



Global SST Departures (°C) During the Last Four Weeks

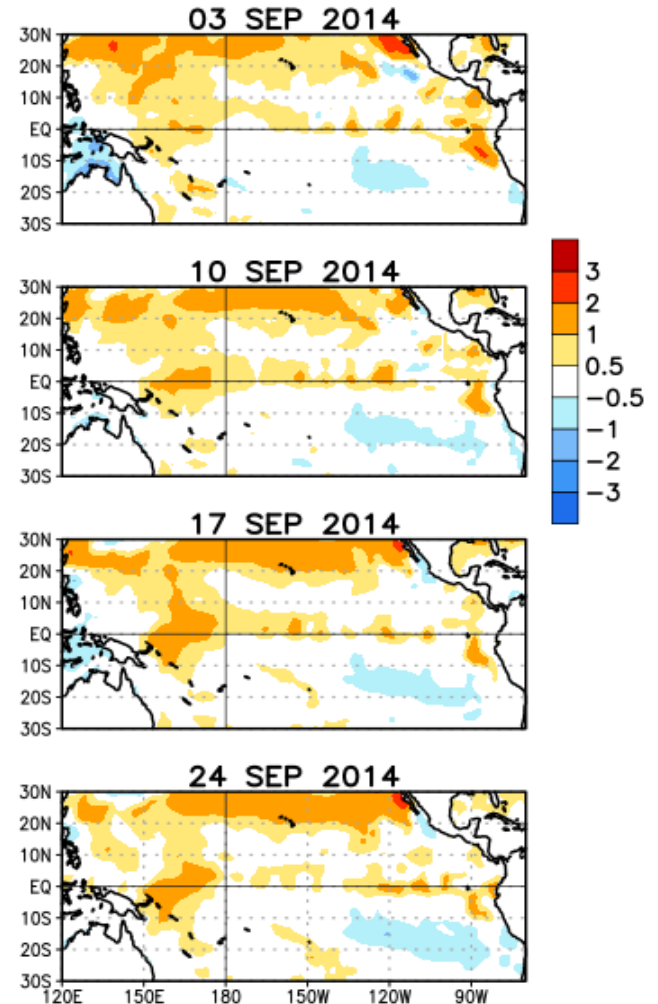
During the last four weeks, equatorial SSTs were above-average across much of the Pacific and eastern Indian Ocean.



Weekly SST Departures during the Last Four Weeks

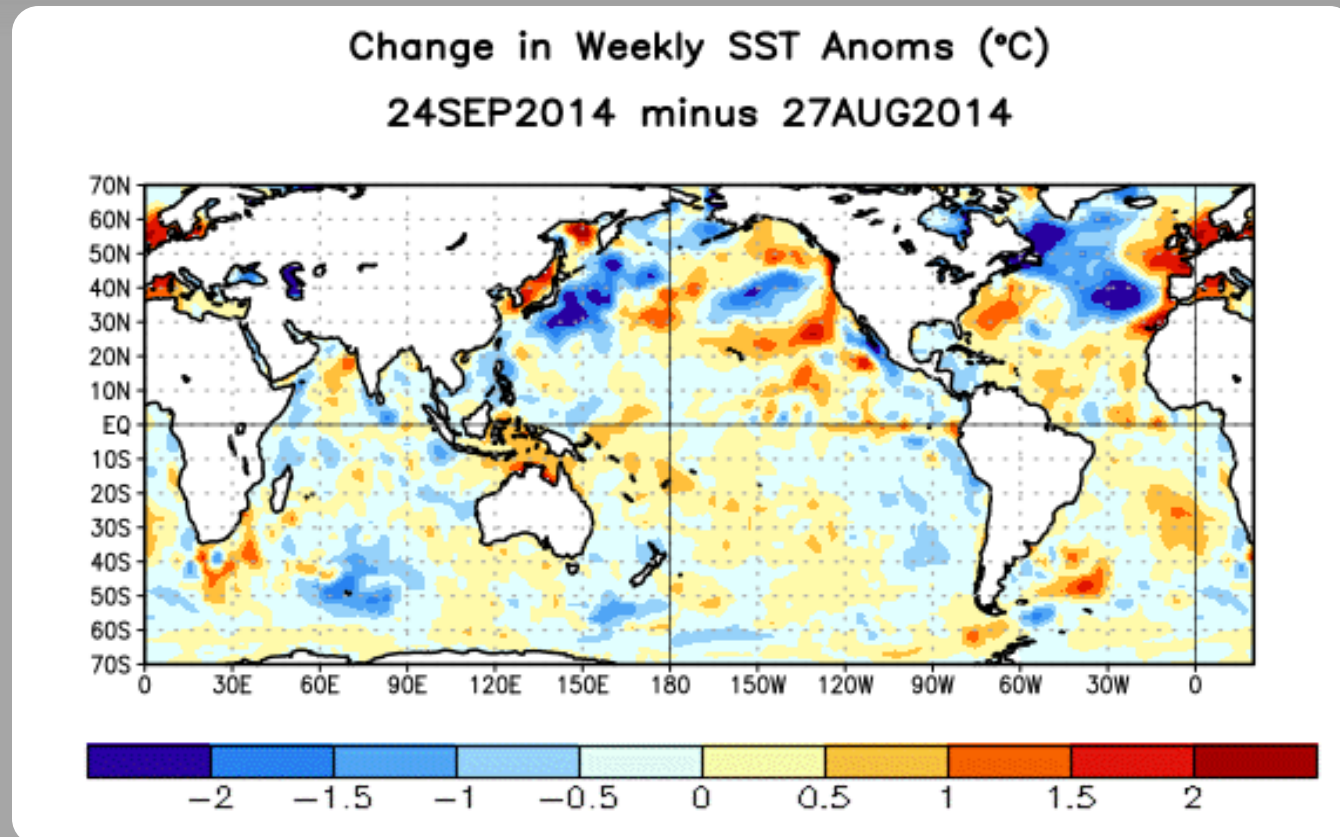
During the last four weeks, positive SST anomalies persisted west of the Date Line and in smaller areas in the eastern half of the equatorial Pacific.

Weekly SST Anomalies (DEG C)



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, little change is evident across the equatorial Pacific Ocean.



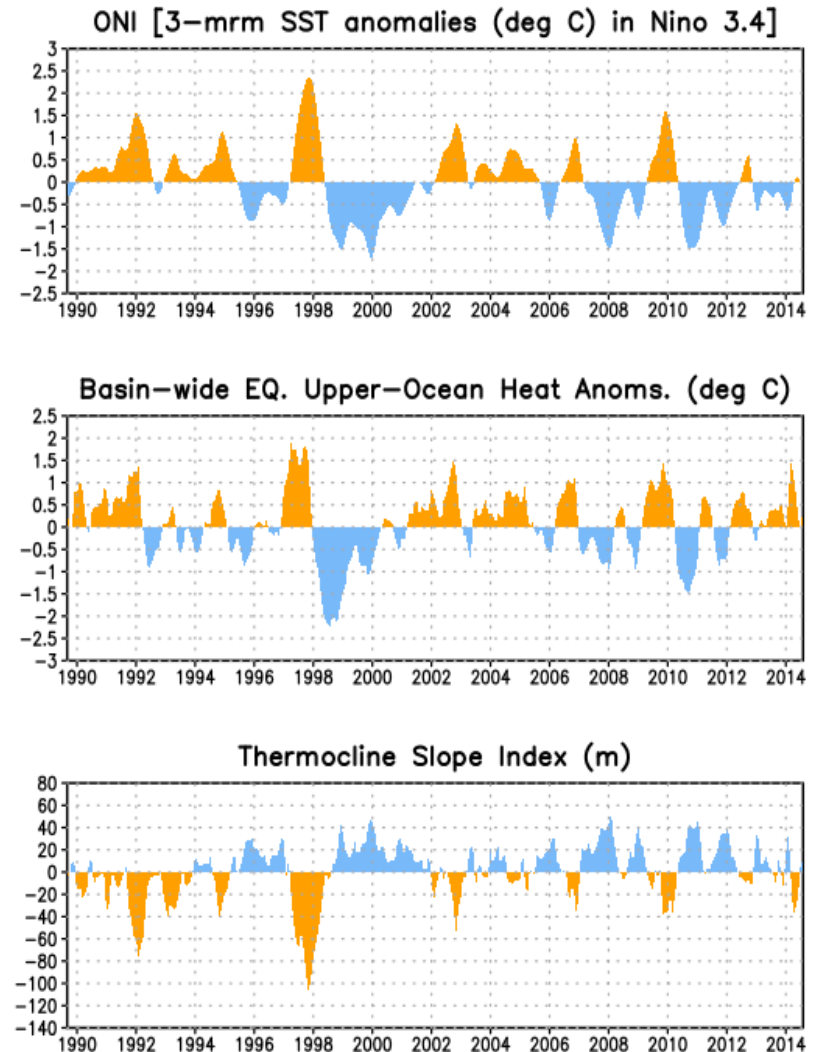
Upper-Ocean Conditions in the Equatorial Pacific

The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

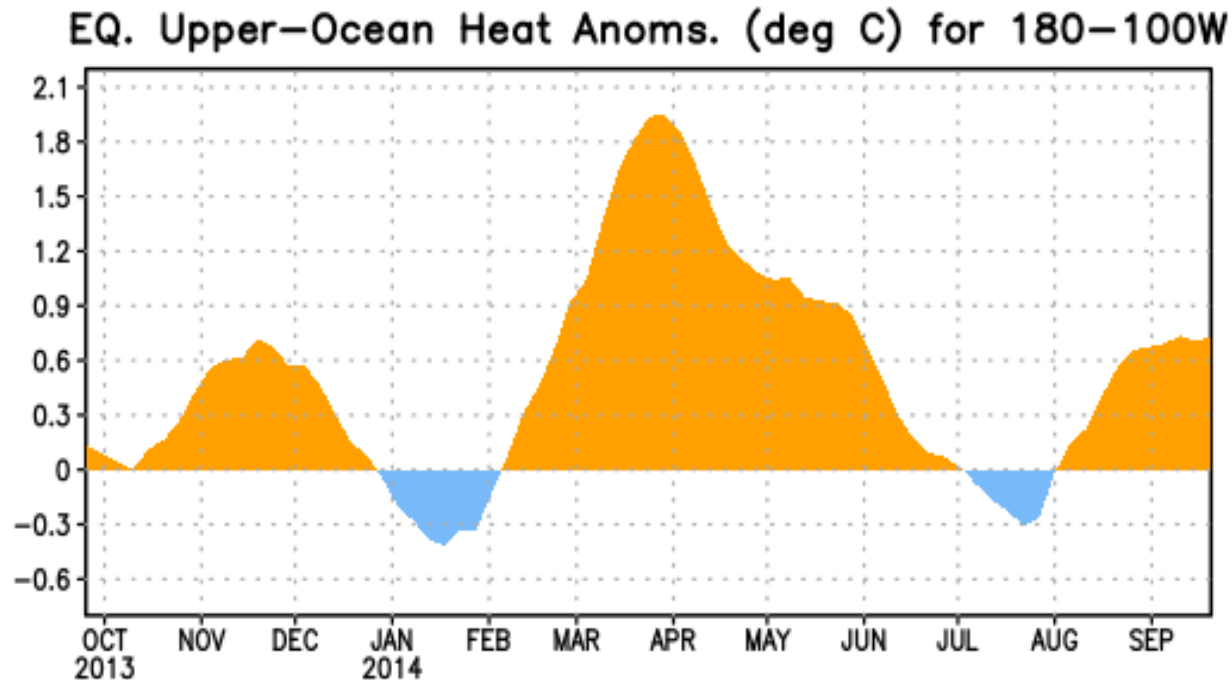
Recent values of the upper-ocean heat anomalies (near zero) and thermocline slope index (near zero) reflect ENSO-neutral conditions.

The monthly thermocline slope index represents the difference in anomalous depth of the 20°C isotherm between the western Pacific (160°E-150°W) and the eastern Pacific (90°-140°W).



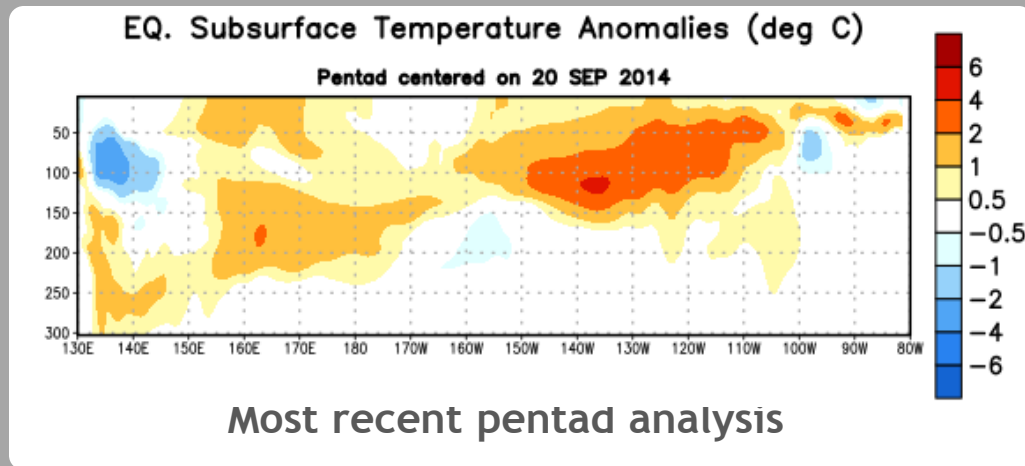
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies strongly increased during January - March 2014. During April-July 2014, the positive anomalies decreased to near zero. Temperature anomalies increased between late July and late August, before leveling off.

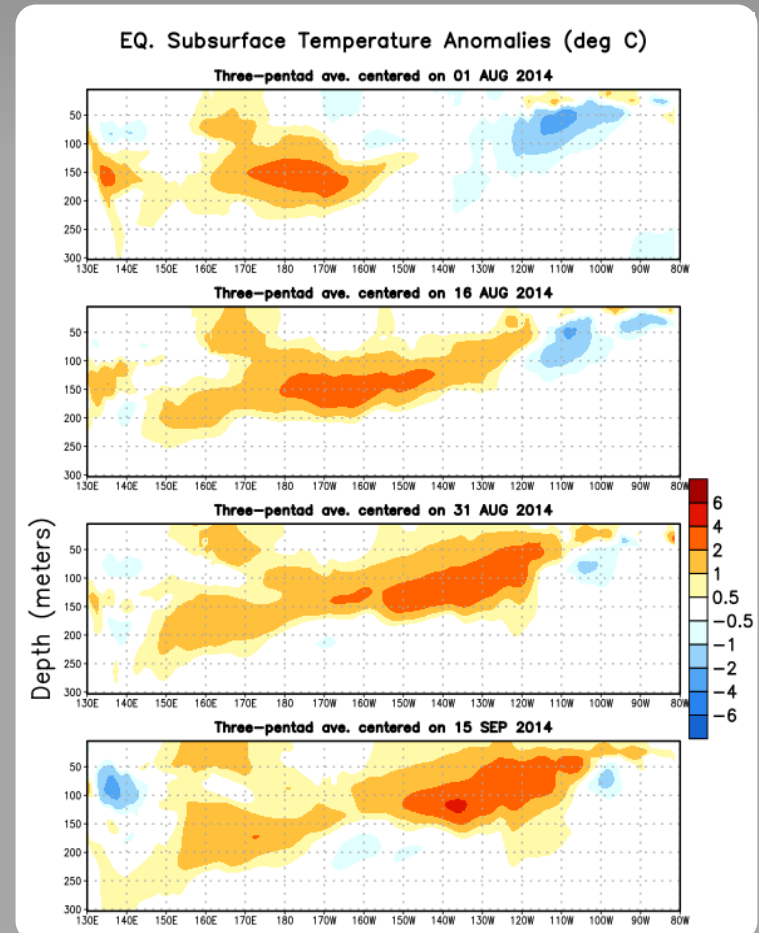


Sub-Surface Temperature Departures in the Equatorial Pacific

The downwelling phase of a Kelvin wave emerged in mid August 2014, as reflected by the eastward shift of positive temperature anomalies.



Positive subsurface anomalies are evident across most of the Pacific, except for a small region of negative anomalies in the eastern Pacific.

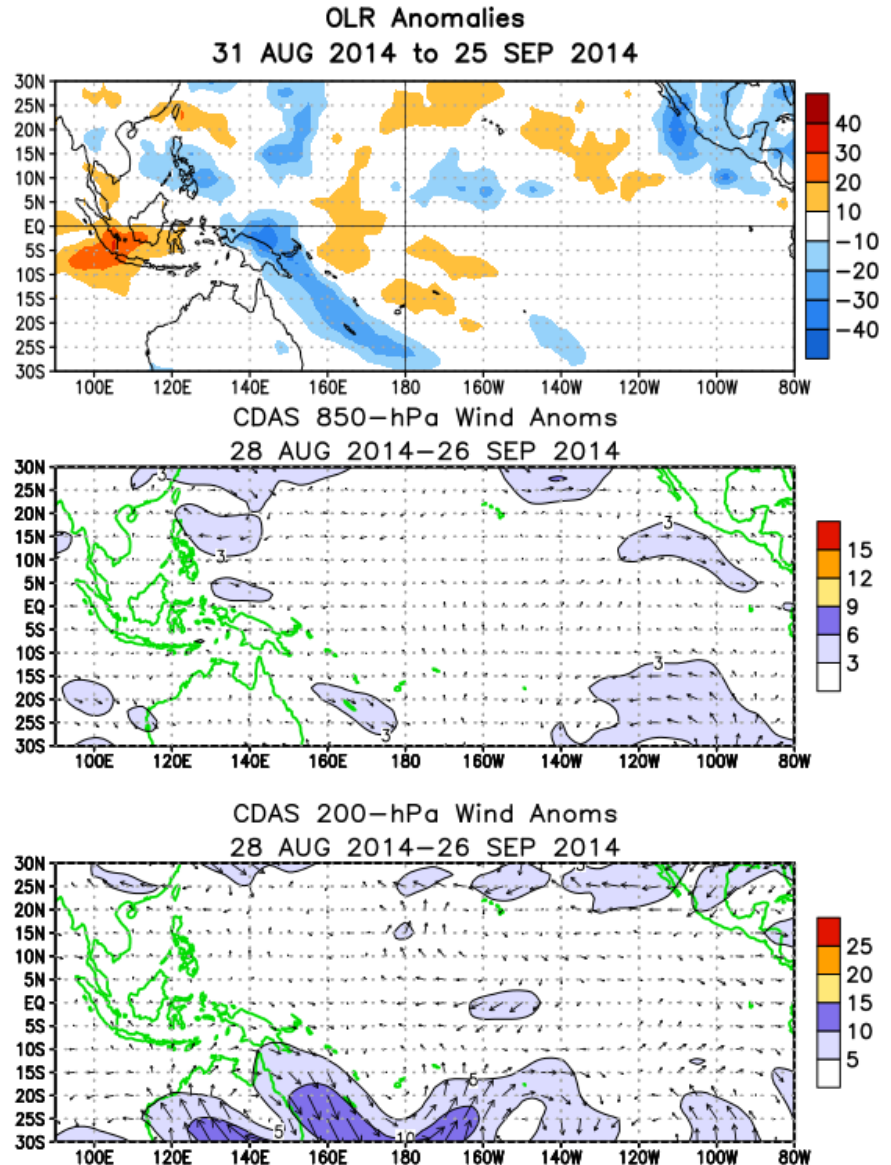


Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation, red shading) were evident around the Date Line and over western Indonesia. Negative OLR anomalies (enhanced convection and precipitation, blue shading) were apparent near Papua New Guinea and the Philippines.

Low-level (850-hPa) winds were near-average across most of the equatorial Pacific.

Easterly upper-level (200-hPa) wind anomalies were observed over the central Pacific.



Intraseasonal Variability

Intraseasonal variability in the atmosphere (wind and pressure), which is often related to the Madden-Julian Oscillation (MJO), can significantly impact surface and subsurface conditions across the Pacific Ocean.

Related to this activity:

Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

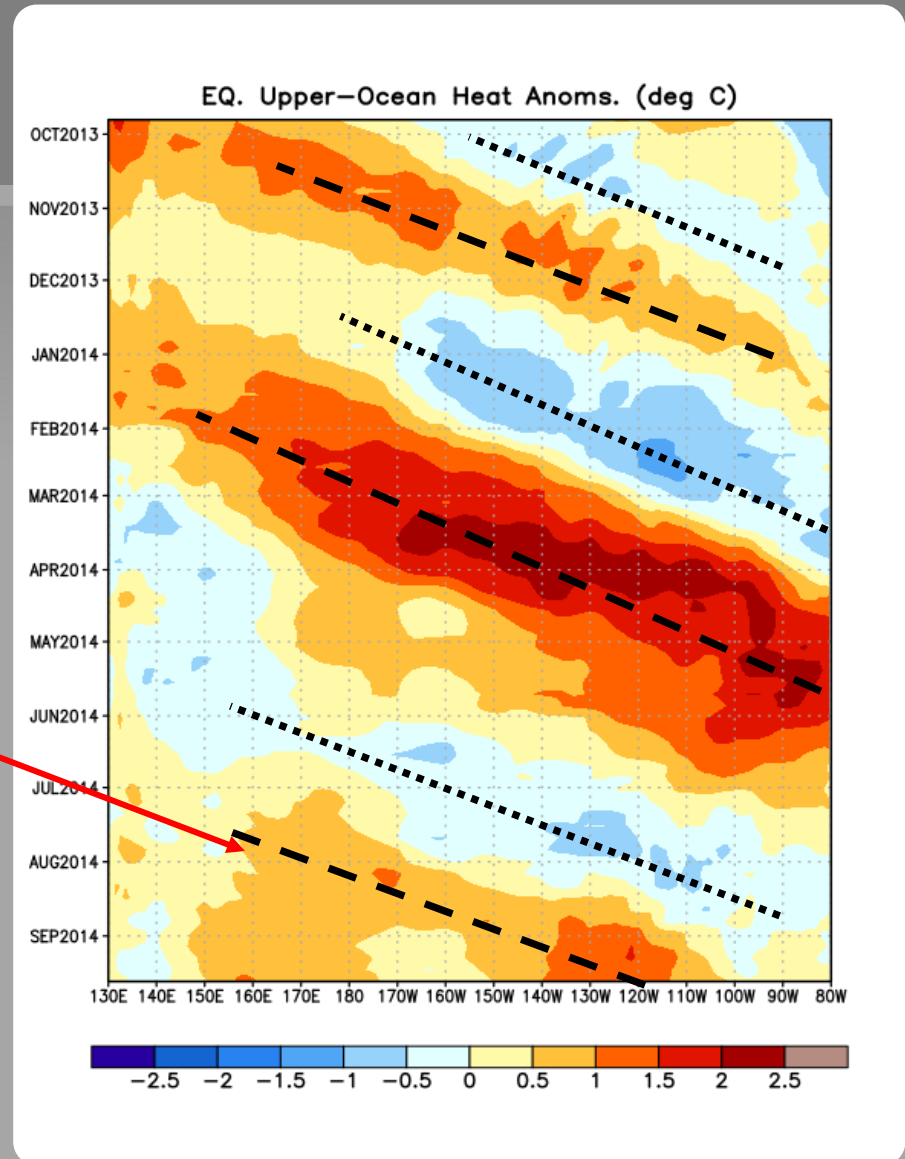
Weekly Heat Content Evolution in the Equatorial Pacific

During January - May 2014, the downwelling phase of a strong Kelvin wave crossed the Pacific.

During May-July, positive temperature anomalies progressively disappeared from the equatorial Pacific in response to the upwelling phase of the Kelvin wave.

Since late July, the downwelling phase of a Kelvin wave has been associated with increased subsurface temperature anomalies across the Pacific.

Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

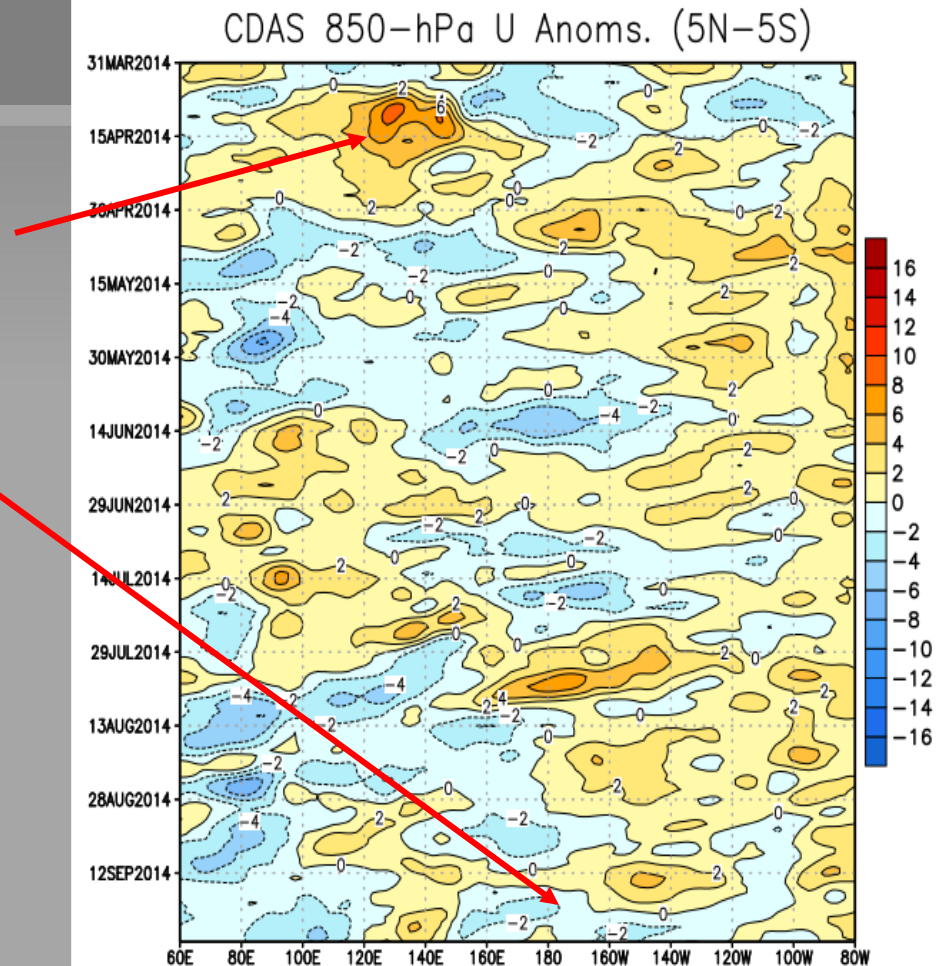


Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

A westerly wind burst occurred over the western Pacific in early April 2014.

Recently, easterly wind anomalies have been present over most of the equatorial Pacific, except for a small region west of 140°E .

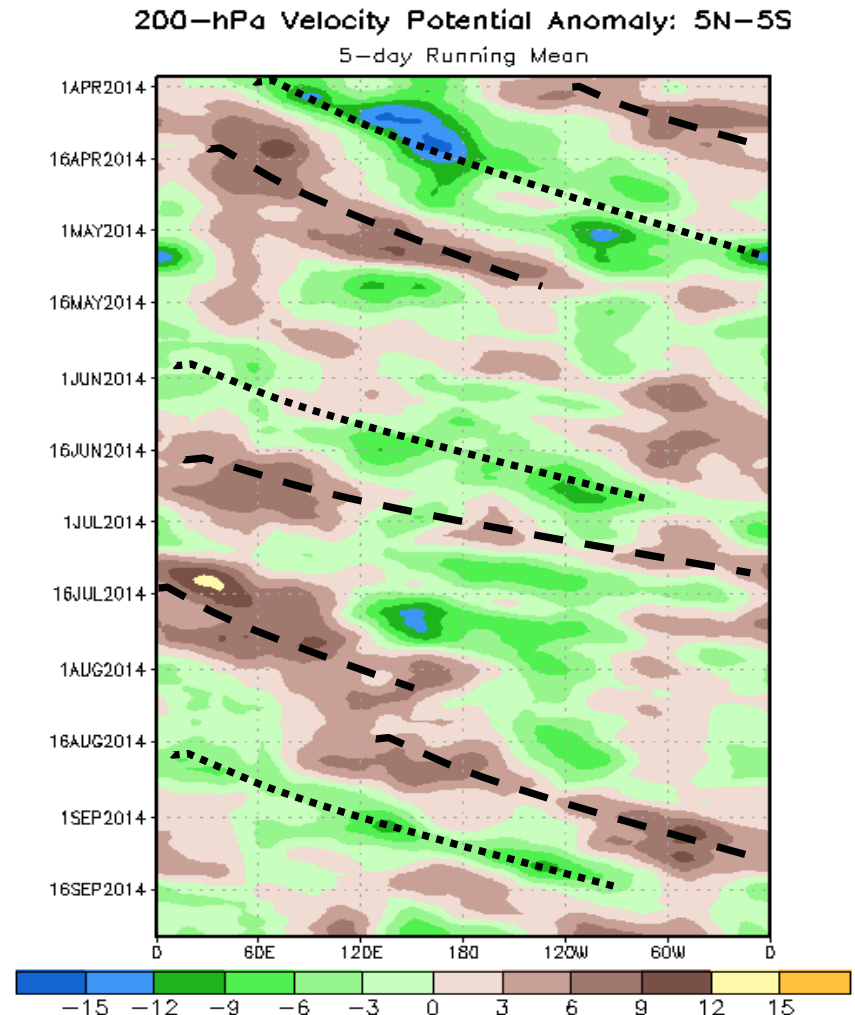
Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)



Upper-level (200-hPa) Velocity Potential Anomalies

During April-May 2014, June-July, and mid August- mid September, eastward propagating velocity potential anomalies were observed.

Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)



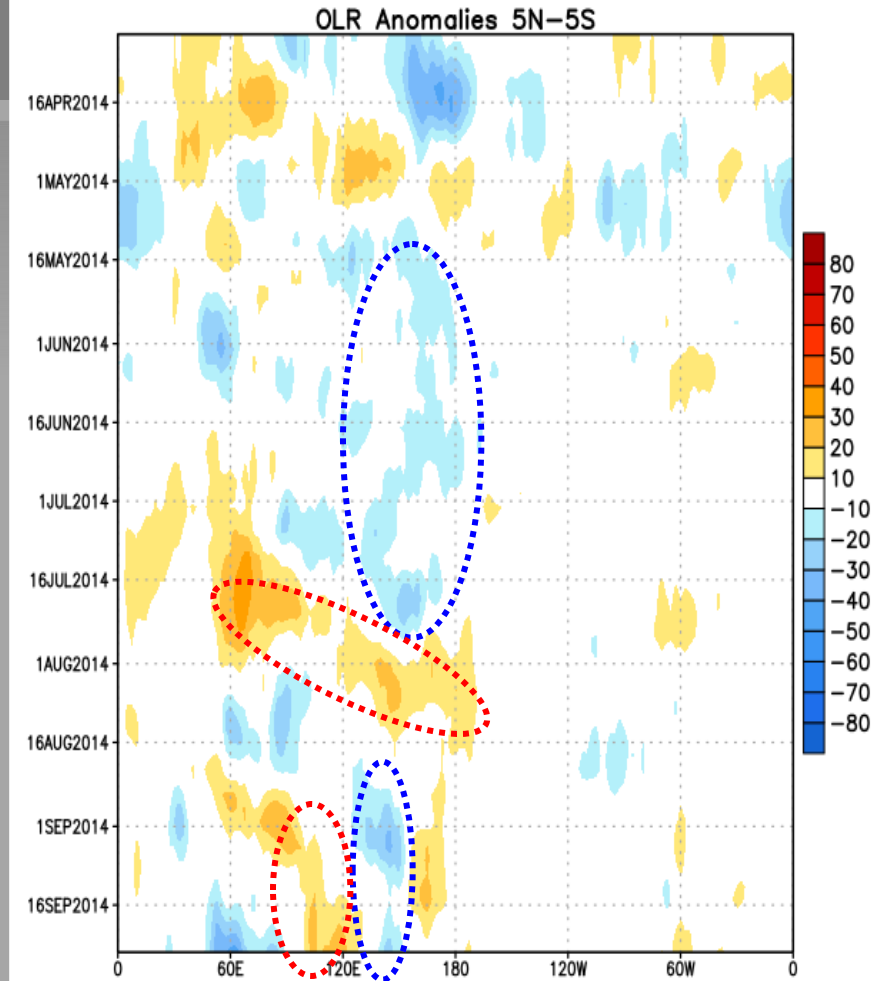
Outgoing Longwave Radiation (OLR) Anomalies

From May through early July, weak negative anomalies persisted over the western equatorial Pacific

During late July-early August 2014, positive OLR anomalies shifted eastward from the Indian Ocean, across Indonesia to near the Date Line.

Recently, negative OLR anomalies have persisted near eastern Indonesia, while positive anomalies were over western Indonesia.

Drier-than-average Conditions (orange/red shading)
Wetter-than-average Conditions (blue shading)



Oceanic Niño Index (ONI)

The ONI is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.

Defined as the three-month running-mean SST departures in the Niño 3.4 region. Departures are based on a set of improved homogeneous historical SST analyses (Extended Reconstructed SST - ERSST.v3b). The SST reconstruction methodology is described in Smith et al., 2008, J. Climate, vol. 21, 2283-2296.)

Used to place current events into a historical perspective

NOAA's operational definitions of El Niño and La Niña are keyed to the ONI index.

NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a positive ONI greater than or equal to $+0.5^{\circ}\text{C}$.

La Niña: characterized by a negative ONI less than or equal to -0.5°C .

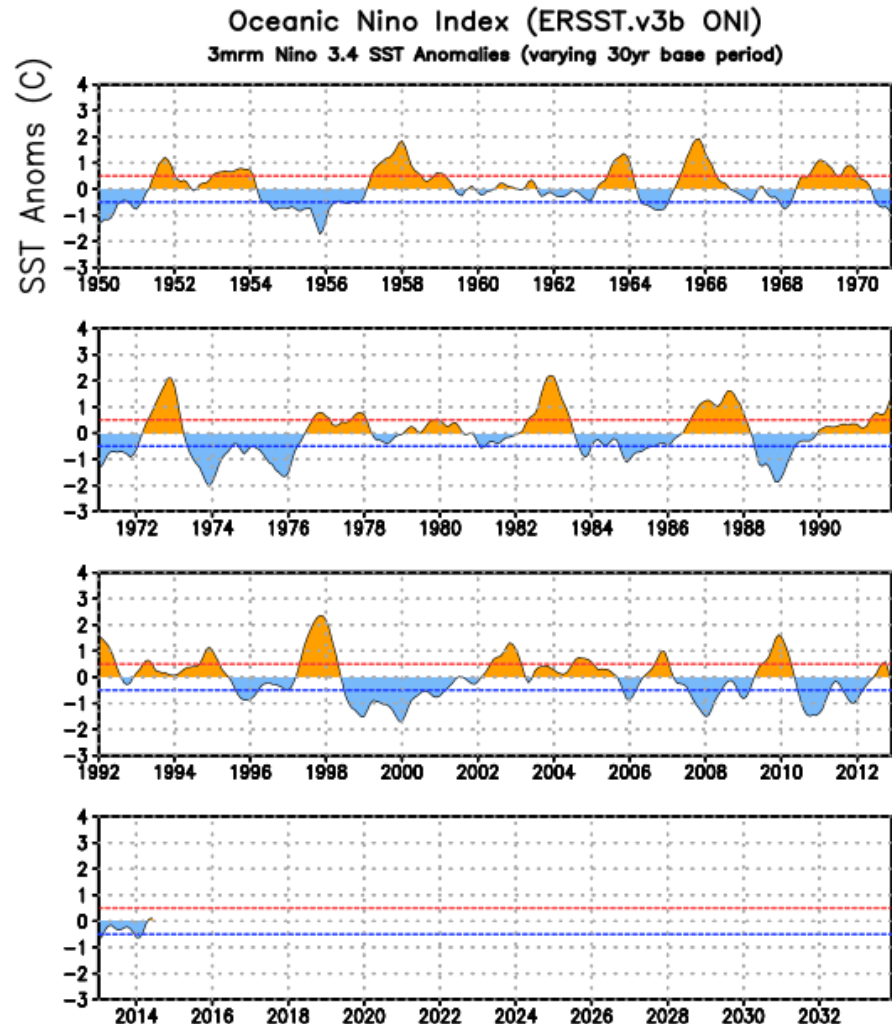
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed $\pm 0.5^{\circ}\text{C}$ along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.

ONI (°C): Evolution since 1950

The most recent ONI value (June - August 2014) is 0.0°C.

El Niño ↑
Neutral
La Niña ↓



Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v3b

El Niño	Highest ONI Value	La Niña	Lowest ONI Value
JJA 1951 - DJF 1951/52	1.2	ASO 1949 - JAS 1950	-1.4
DJF 1952/53 - JFM 1954	0.8	SON 1950 - JFM 1951	-0.8
MAM 1957 - JJA 1958	1.8	AMJ 1954 - NDJ 1956/57	-1.7
OND 1958 - FMA 1959	0.6	AMJ 1964 - DJF 1964/65	-0.8
MJJ 1963 - JFM 1964	1.4	JJA 1970 - DJF 1971/72	-1.3
AMJ 1965 - MAM 1966	1.9	AMJ 1973 - JJA 1974	-2.0
JAS 1968 - DJF 1969/70	1.1	SON 1974 - MAM 1976	-1.7
AMJ 1972 - FMA 1973	2.1	ASO 1983 - DJF 1983/84	-0.9
ASO 1976 - JFM 1977	0.8	SON 1984 - ASO 1985	-1.1
ASO 1977 - JFM 1978	0.8	AMJ 1988 - AMJ 1989	-1.9
AMJ 1982 - MJJ 1983	2.2	ASO 1995 - FMA 1996	-0.9
JAS 1986 - JFM 1988	1.6	JJA 1998 - FMA 2001	-1.7
AMJ 1991 - MJJ 1992	1.6	OND 2005 - FMA 2006	-0.9
ASO 1994 - FMA 1995	1.2	JAS 2007 - MJJ 2008	-1.5
AMJ 1997 - MAM 1998	2.4	OND 2008 - FMA 2009	-0.8
AMJ 2002 - JFM 2003	1.3	JJA 2010 - MAM 2011	-1.5
JJA 2004 - DJF 2004/05	0.7	ASO 2011 - FMA 2012	-1.0
ASO 2006 - DJF 2006/07	1.0		
JJA 2009 - MAM 2010	1.6		

NOTE (Mar. 2012): The historical values of the ONI have slightly changed due to an update in the climatology. Please click [here](#) for more details on the methodology.

Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v3b

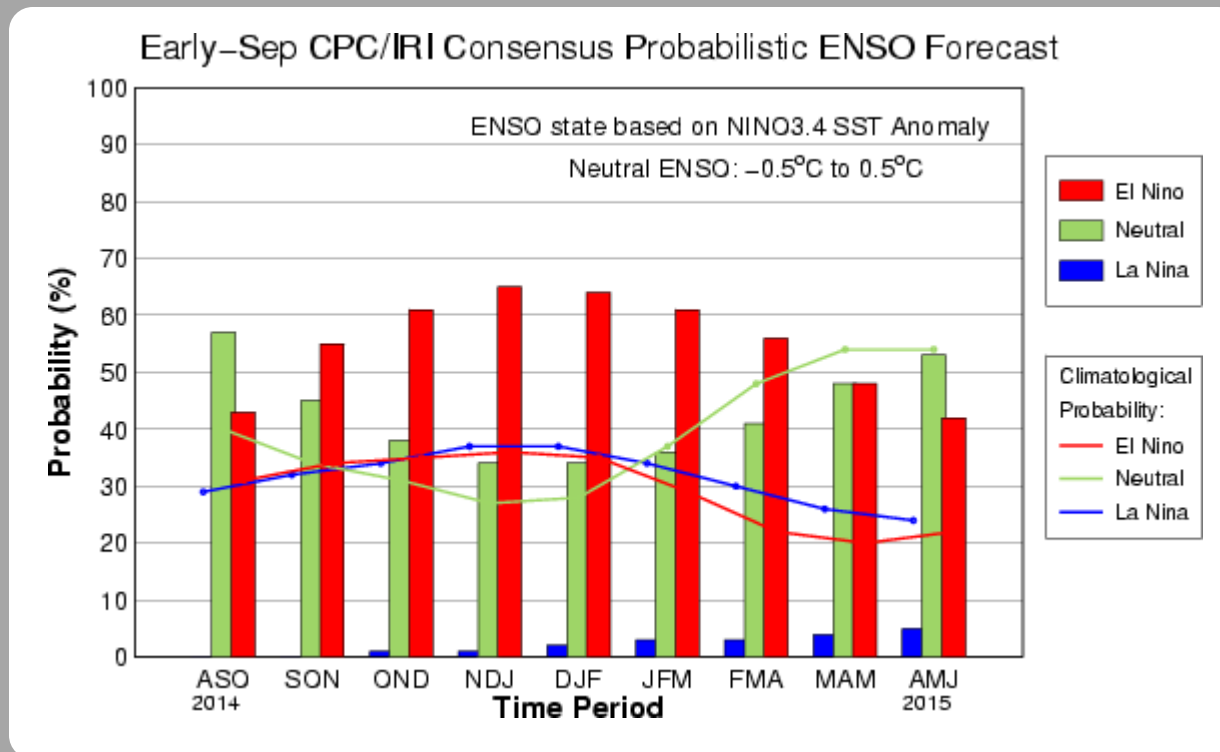
Recent Pacific warm (red) and cold (blue) episodes based on a threshold of ± 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes El Niño and La Niña episodes are defined when the threshold is met for a minimum of 5 consecutive over-lapping seasons. The complete table going back to DJF 1950 can be found [here](#).

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
2003	1.1	0.8	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	0.8	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.4	-0.6	-0.8	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.5	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.2	0.4	0.5	0.6	0.8	1.1	1.4	1.6
2010	1.6	1.3	1.0	0.6	0.1	-0.4	-0.9	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.2	-0.9	-0.6	-0.3	-0.2	-0.2	-0.4	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.6	-0.5	-0.3	-0.2	0.0	0.1	0.4	0.5	0.6	0.2	-0.3
2013	-0.6	-0.6	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4
2014	-0.6	-0.6	-0.5	-0.1	0.1	0.1	0.0					

CPC/IRI Probabilistic ENSO Outlook

Updated: 4 September 2014

The chance of El Niño is at 60-65% during the Northern Hemisphere fall and winter.



IRI/CPC Pacific Niño

3.4 SST Model Outlook

Most models favor El Niño (greater than or equal to $+0.5^{\circ}\text{C}$) to develop during October-December 2014 and persist through Northern Hemisphere winter 2014-15.

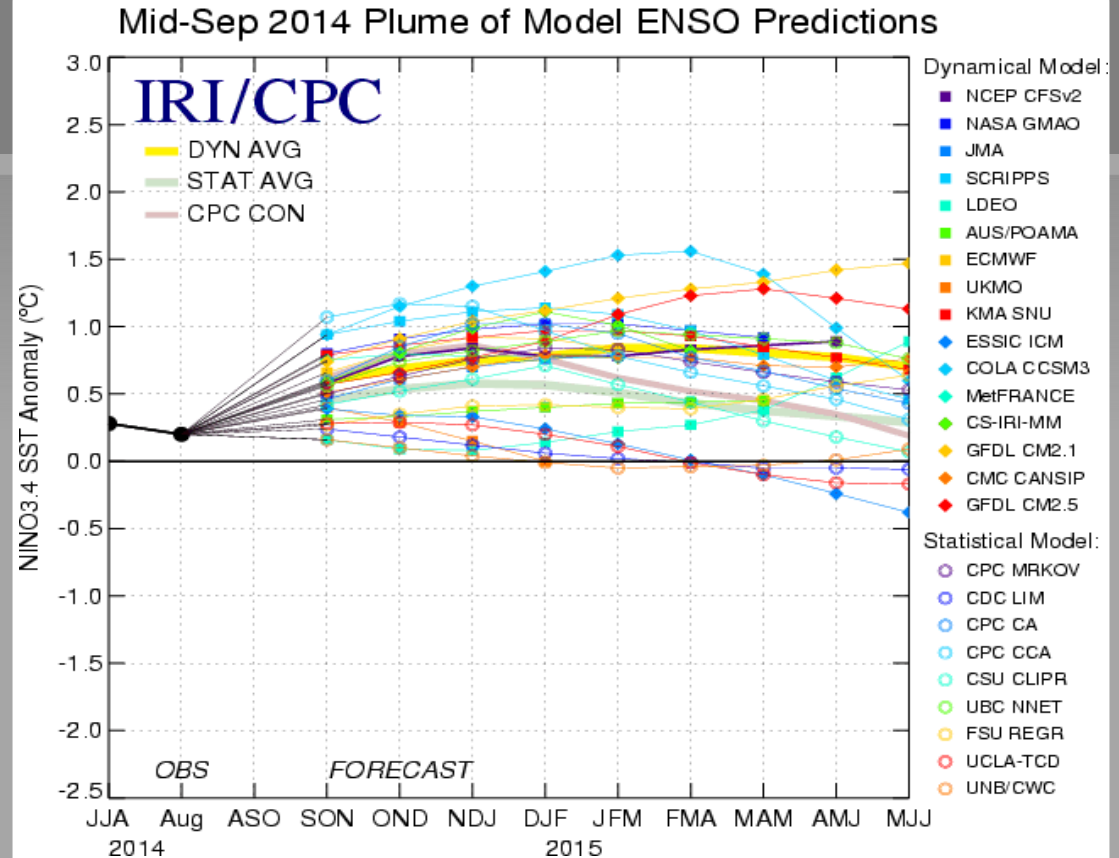
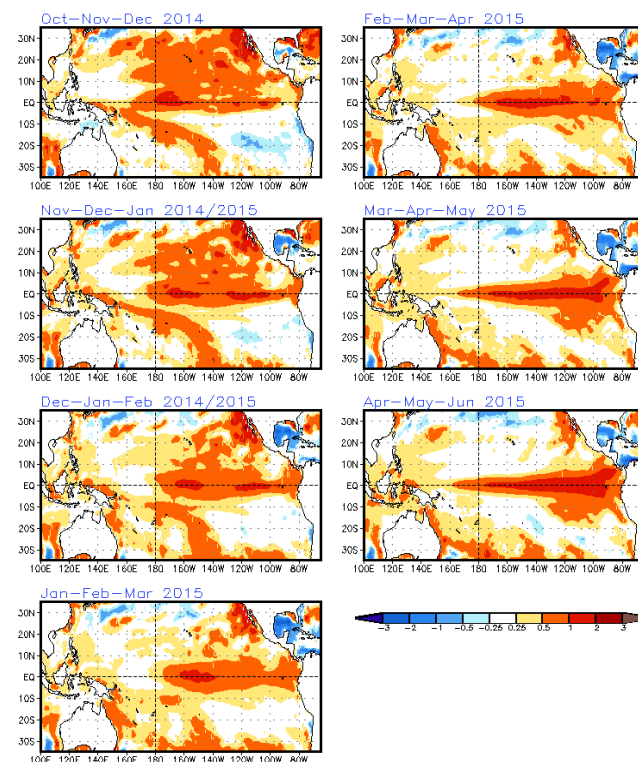
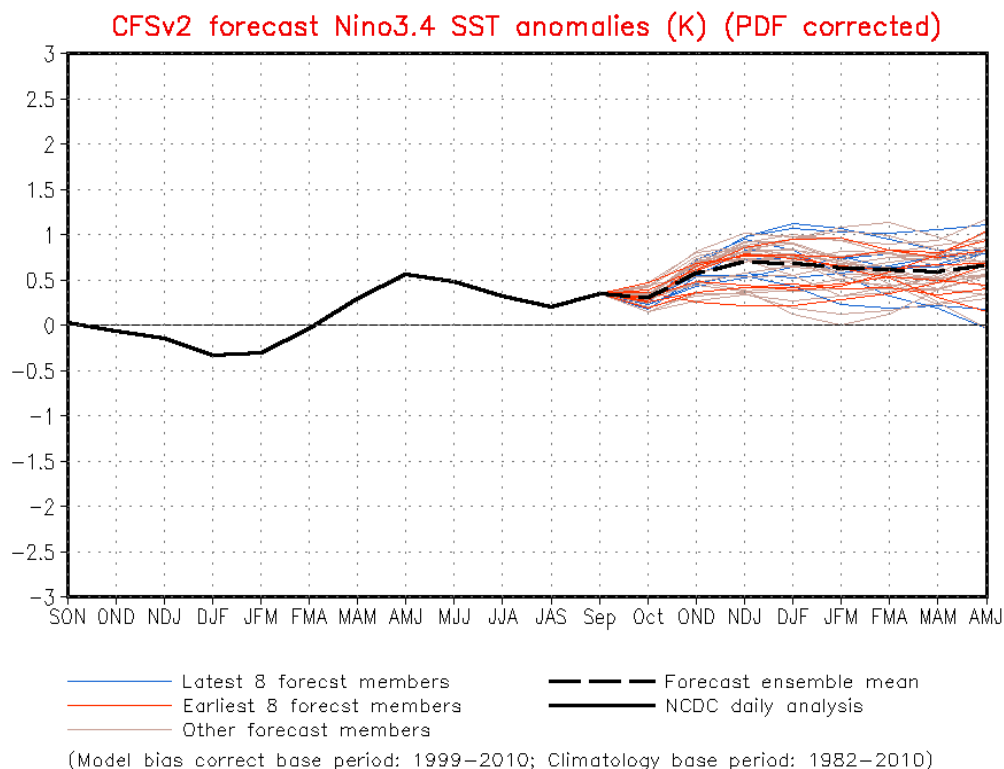


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 16 September 2014).

SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

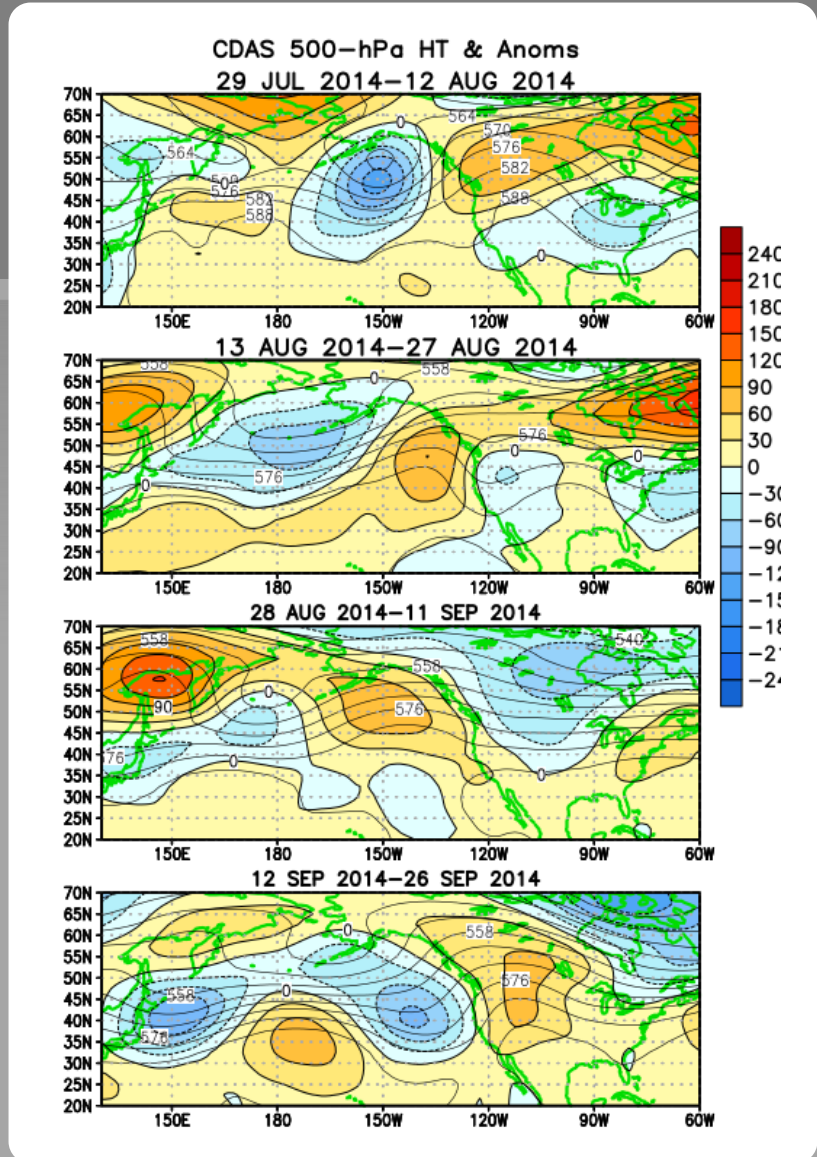
Issued: 29 September 2014

The CFS.v2 ensemble mean (black dashed line) predicts El Niño starting around October-December 2014 and lasting through early 2015.



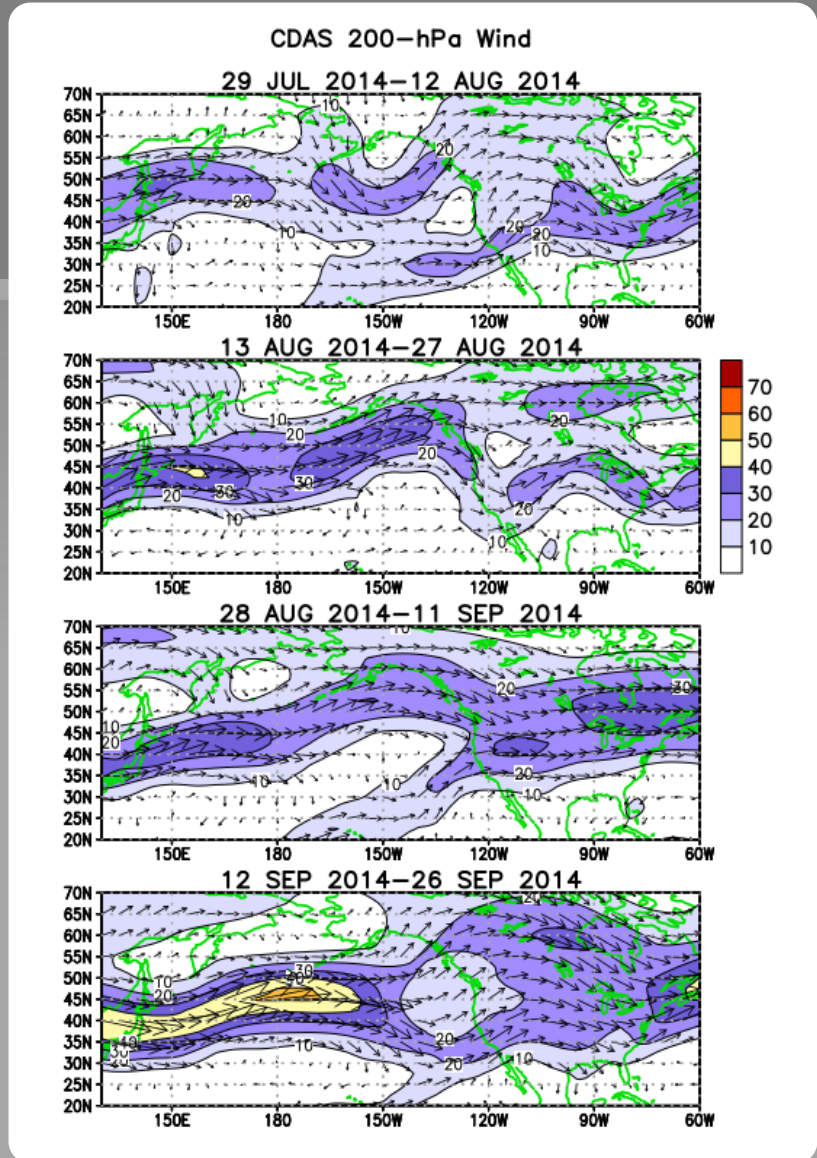
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

During late July- September, the pattern was mostly dominated by an anomalous trough over the central and eastern U.S., which contributed to below-average temperatures in the region.



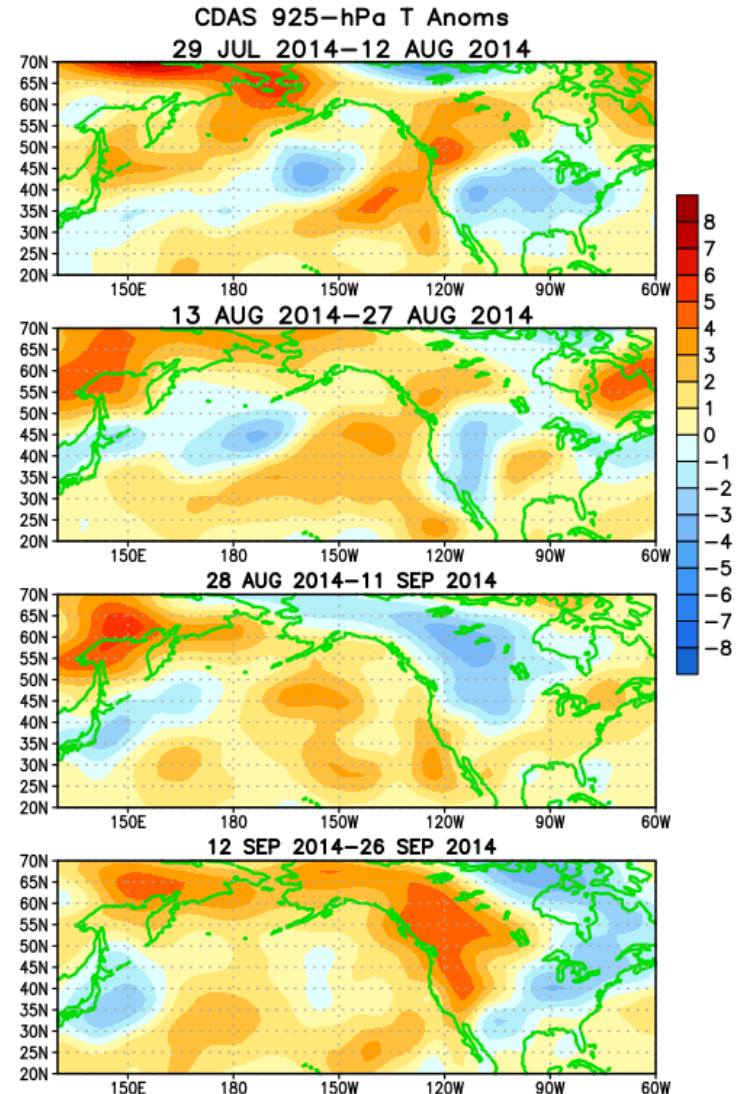
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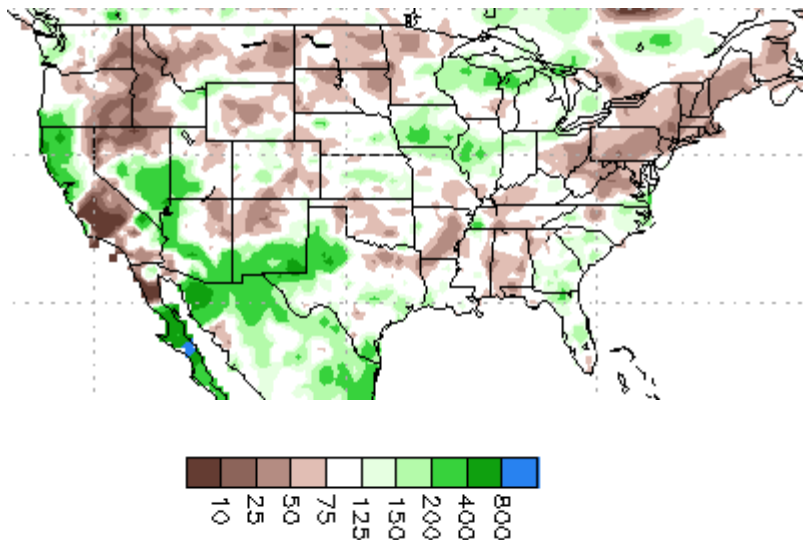
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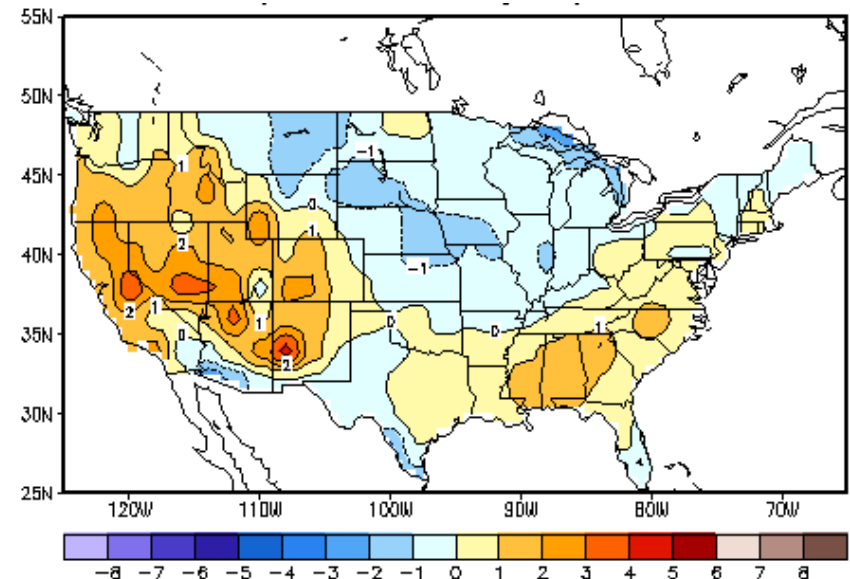
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 27 September 2014

Percent of Average Precipitation



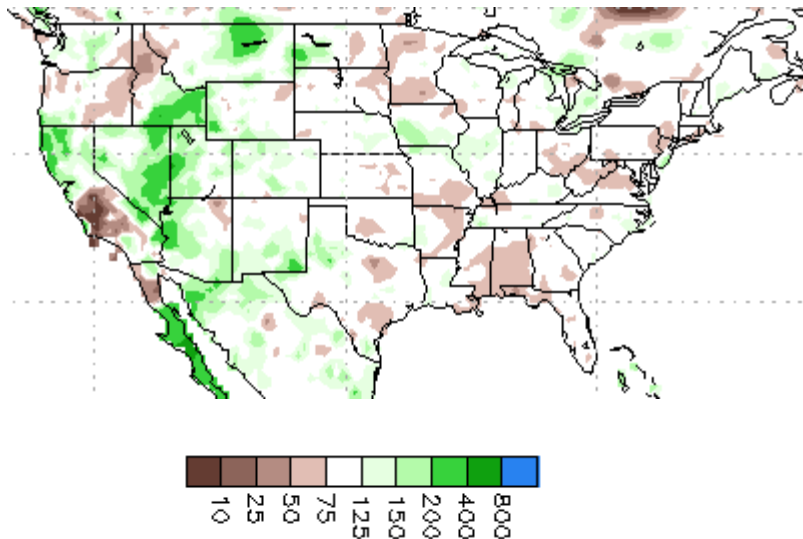
Temperature Departures (degree C)



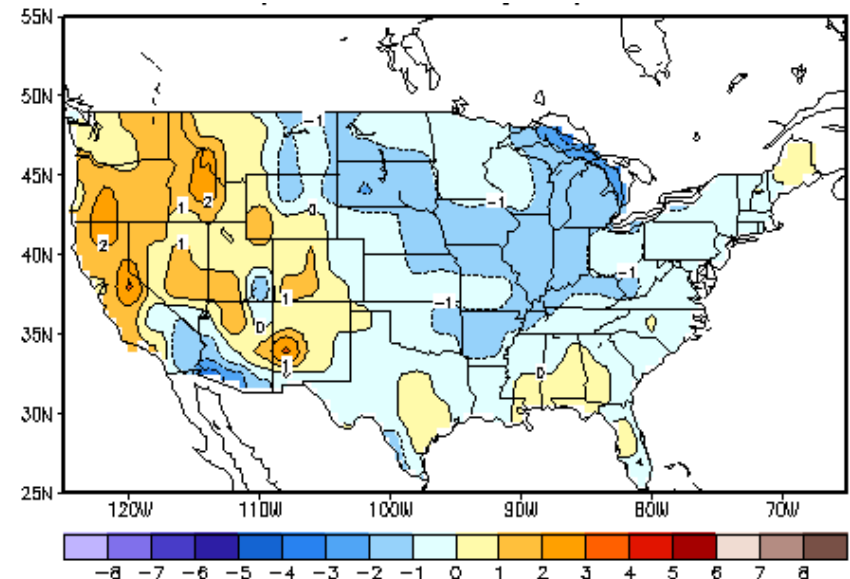
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 27 September 2014

Percent of Average Precipitation



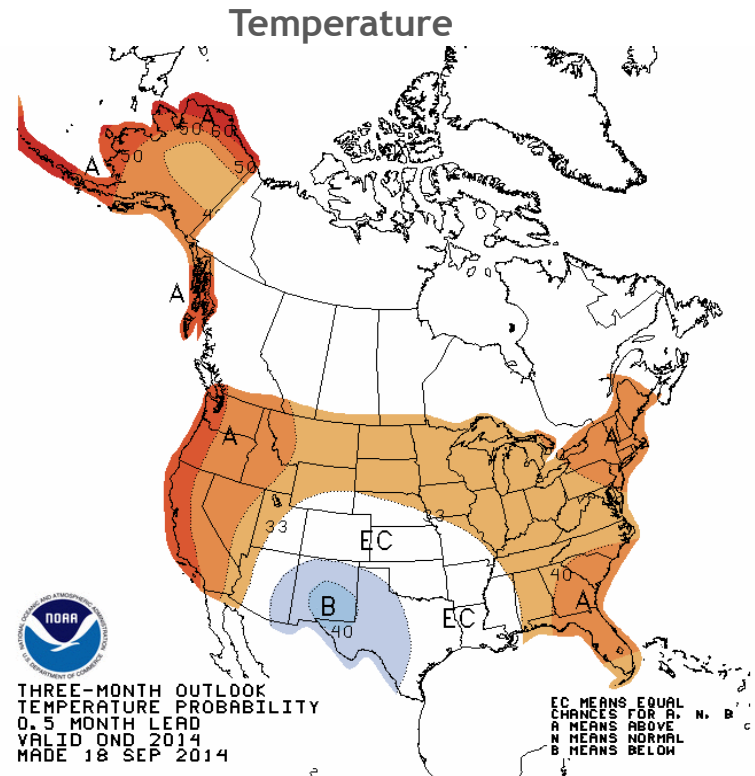
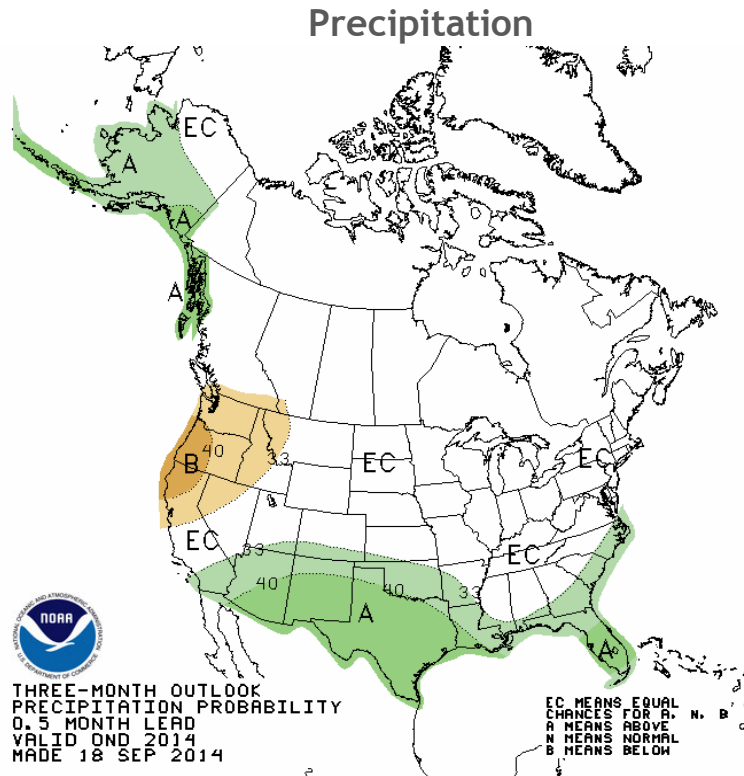
Temperature Departures (degree C)



U. S. Seasonal Outlooks

October - December 2014

The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.



Summary

ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

Positive equatorial sea surface temperature (SST) anomalies continue across most of the Pacific Ocean.

The chance of El Niño is at 60-65% during the Northern Hemisphere fall and winter.*

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